



The Malaysian Eagle Aerial Reconnaissance Vehicle (ARV)

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Objective



- To explain the reasons why Eagle 150 was selected as the platform for the Malaysian Aerial Reconnaissance Vehicle (ARV) Program and to highlight the benefits of having manned and unmanned operational capability
- To discuss the process by which Composite Technology Research Malaysia (CTRM), Excelnet Sdn. Bhd., and BAE SYSTEMS converted the Eagle 150 twin-seater aircraft into an ARV in less than 8 months.



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Eagle-150B Aircraft



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Why an Eagle-150B Aircraft?

Eagle-150 aircraft is a two-seater, single engine of a fully composite light aircraft.

- Certified by CASA, FAA and JAR.
- Handling qualities ideally suited for surveillance missions
 - Outstanding low speed control
 - Able to operate from short, unimproved runways
 - Stable in all flight regimes
- All composite structure
 - Low observable
 - Corrosion resistance
 - High impact strength
 - Long fatigue life
- Low life-cycle cost
 - Low operating and maintenance cost
 - Existing support for maintenance and spares in Malaysia



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Eagle ARV



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Why an Aerial Reconnaissance Vehicle (ARV)?



The main reason for developing an ARV is to obtain system flexibility to meet a variety of mission profiles for both manned and unmanned missions using the same aircraft.

Unmanned version applications and benefits

- For hazardous missions
 - Chemical or nuclear contaminant detection
 - Hostile and threat area operations
- For long endurance missions
 - Coastal water surveillance missions
 - Operations in remote areas



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Why an Aerial Reconnaissance Vehicle (ARV)?



Manned version applications and benefits

- Able to operate in civil airspace
- Added situation awareness for surveillance missions
- Valuable for training purposes
 - Operational conversion for pilots
 - Mission rehearsal and tactics development
 - Providing a good low cost lead-in platform for more advanced UAVs
- Easy for rapid re-deployment as the ARV can be piloted to the new operational site



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Missions of Eagle ARV

It is intended that the aircraft is able to provide a range of airborne military and commercial surveillance capabilities suitable for a broad spectrum of operational environments including:

- **Battlespace command and patrol**
- **Coastal and border patrolling**
- **Off-shore monitoring of illegal trafficking and piracy**
- **Identification of water & air pollution sources**
- **Prevention of illegal logging**
- **Assisting in air, land and sea rescue operations**
- **Crowd and traffic surveillance and management**
- **Disaster area management and communications**

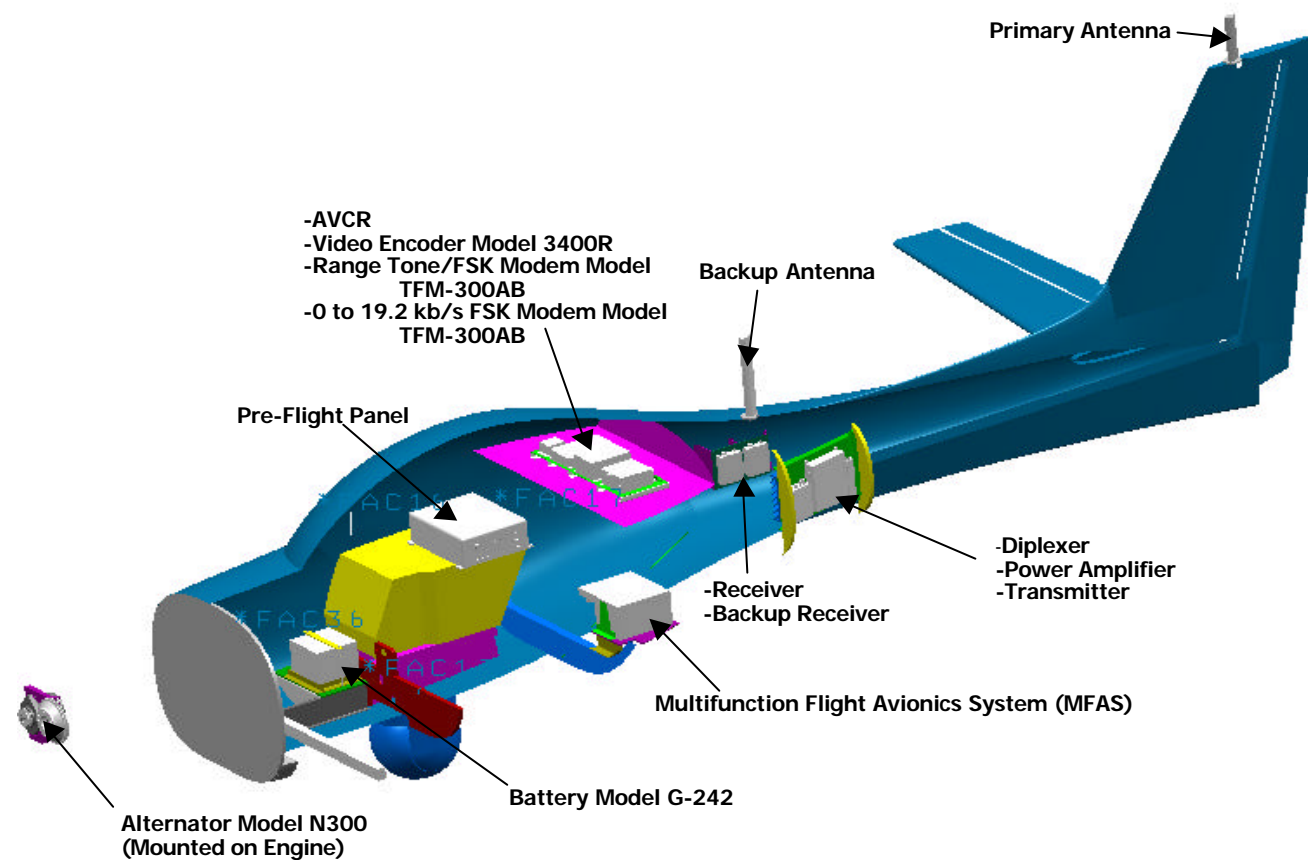


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Eagle ARV Equipment Installation

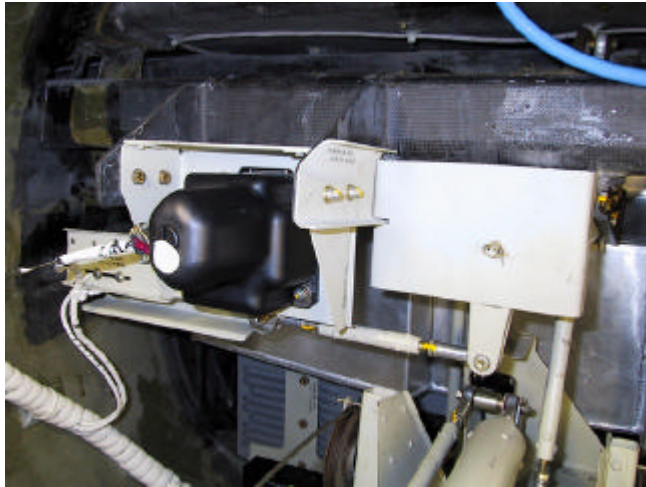


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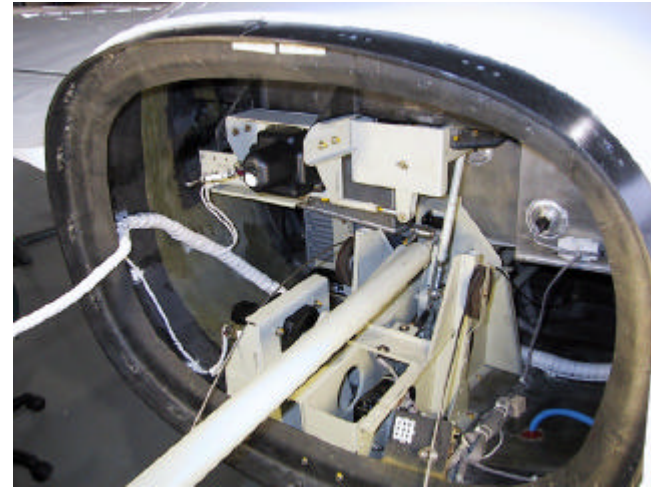


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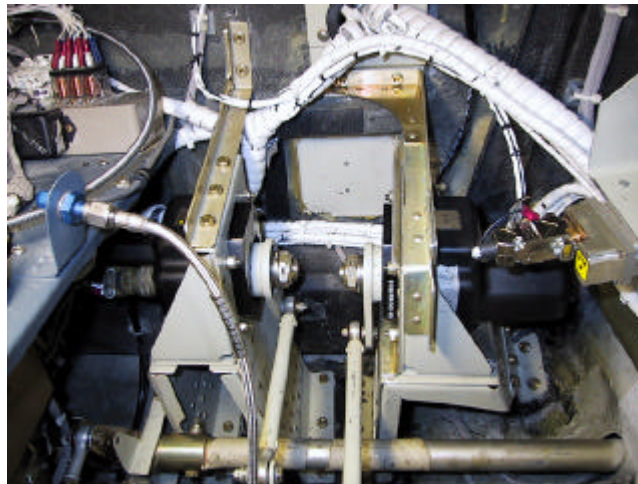
Aircraft/Flight Control Modifications



*Aileron actuator
installation*



*ARV Main flight
control box*



Rudder actuator



CTRM

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Eagle ARV Specifications and Performance



Air Vehicle Performance

Max Level Speed	133 knots	240 km/h
Cruise Speed	120 knots	216 km/h
Best Loiter Speed	65 to 75 knots	117 to 139 km/h
Stall Speed (Clean)	56 knots	101 km/h
Stall Speed (Full Flaps)	45 knots	83 km/h
Range (From GCS)	124 nm	200 km
Endurance	10 hrs	
Ceiling Altitude	12000 ft	4877 m



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Eagle ARV Specifications and Performance



Air Vehicle Dimensions

Wing Span	23 ft 6 in	7.163 m
Length Overall	21 ft 2 in	6.492 m
Height Overall	7 ft 7 in	2.324 m

Propulsion

Engine	TCM IO 240-125 hp
Propeller	Metal - McCauley

Crew Requirements

GCS	2
Support	6



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System Features

The Eagle ARV system comprises three aircraft, a ground station and a remote receiving station.

The Eagle ARV's integrated surveillance system comprises of:

- A 15:1 continuous zoom color EO imaging sensor
- A spotter scope imaging sensor
- Third generation step-zoom FLIR

This equipment is integrated into a lightweight turret mounted in the underbelly of the aircraft. This provides the operator with an unobstructed 360 ° field of view.

All sensor data is recorded onto dual S-VHS recorders that allow the operator to replay previously recorded imagery.



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Ground Control Station Features

- The Eagle ARV's Ground Control Station (GCS) is built into a single trailer, containing pilot and payload operator consoles. This includes a Data Exploitation and Mission Planning System which is capable of accepting up to 256 pre-planned waypoints, together with a microwave line-of-sight ground data terminal.
- The ARV is controlled in real time up to a distance of 200 km while flying a line-of-sight profile for up to 10 hours without re-fuelling. The GCS can send imagery data via a landline to a networked command center or to a remotely sited data distribution system.



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The Ground Control Station



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Problems Encountered

- **Insufficient Air Regulations for fully autonomous/unmanned flight. The Eagle ARV was issued a “permit to fly” under the “Military Experimental” category**
 - **To gain user’s confidence for unmanned flight a Ballistic Recovery System (BRS) was added.**
 - **Added ATC voice relay and remotely tunable IFF**
- **Slight decrease in the ARV’s performance. Higher than expected drag induced by the payloads has reduced the intended altitude and range.**



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THANK YOU



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